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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,072	03/15/2004	Yan R. Kucherov	13693.22.1	1261
22913	7590	09/12/2005	EXAMINER	
WORKMAN NYDEGGER (F/K/A WORKMAN NYDEGGER & SEELEY) 60 EAST SOUTH TEMPLE 1000 EAGLE GATE TOWER SALT LAKE CITY, UT 84111			DIAMOND, ALAN D	
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/801,072

Applicant(s)

KUCHEROV ET AL.

Examiner

Alan Diamond

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-8 and 12-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 34 and 37 is/are allowed.
- 6) ☒ Claim(s) 2-8, 12-33, 35 and 36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 29, 2005 has been entered.

Comments

2. The indicated allowability of claim 12-16 and 17-21 is withdrawn in view of the art rejections set forth below.

Claim Objections

3. Claim 29 is objected to because of the following informalities: In claim 29, at line 2, there is a period missing at the end of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-6, 8, 12-27, 29-33, 35, and 36 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over JP 2001-217469, herein referred to as JP '469. It should be noted that none of Serials Nos. 10/307,241, 09/519,640, and 60/123,900 fully supports the instantly claimed subject matter. Accordingly, the instant claims, at best, have an effective U.S. filing date of March 13, 2003. JP '469 has a 102(b) date of August 10, 2001.

JP '469 teaches a thermoelectric conversion element having the structure p/n/p/n/p/n/p/n/p, wherein, when the hot heat exchange surface is at the left of the device, it is the Examiner's position that the first n from the left reads on the instant emitter region, the second p from the left reads on the instant barrier layer, and the combination of the second n from the left and the third p from the left reads on the instant semiconductor gap region (see Figure 1A; and Table 1). Alternatively, with respect to said gap region, the combination of the second n from the left, the third p from the left and the third n from the left reads on the instant semiconductor gap region. With respect to claim 17, and in said alternative, the third p from the left reads on the instant first layer of semiconductor material, and the third n from the left reads on instant different highly n-doped semiconductor material. Said third n from the left is different from the third p because it is n-doped rather than p-doped; and the n doping is high in view of the 0.4 At% n-type doping in JP '469's Table 1. It is the Examiner's position that said barrier layer inherently provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region. When the first p from the left reads on the

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instant emitter region, the first n from the left reads on the instant barrier layer, and the combination of the second p from the left and the second n from the left reads on the instant semiconductor gap region (see Figure 1A; and Table 1). With respect to claim 31-33, JP '469's thermoelectric conversion element has plural n/p/n. The last p at the right of Figure 1A reads on the p_c in claim 31 and the p_i in claim 33. The last p (at the right) reads on the instant collector region, and JP '469 teaches the use of ohmic contacts (i.e., electrodes) as here claimed, and an external load (see paragraph 0053). It is the Examiner's position that said gap region inherently is at least 1, e.g., at least 5, carrier scattering lengths wide when JP '469's device is prepared using the materials in its example at paragraphs 0051-0054. Since JP '469 teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

In addition, the presently claimed emitter region, semiconductor gap, barrier layer, scattering lengths, and requirement that the barrier layer provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region would obviously have been present once JP '469's thermoelectric device has been provided. Note In re Best, 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made above under 35 USC 102.

Claim Rejections - 35 USC § 103

7. Claims 7 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2001-217469, herein referred to as JP '469. It should be noted that none of Serials Nos. 10/307,241, 09/519,640, and 60/123,900 fully supports the instantly claimed

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subject matter. Accordingly, the instant claims, at best, have an effective U.S. filing date of March 13, 2003. JP '469 has a 102(b) date of August 10, 2001.

JP '469 teaches a thermoelectric conversion element having the structure p/n/p/n/p/n/p/n/p/n/p, wherein, when the hot heat exchange surface is at the left of the device, it is the Examiner's position that the first n from the left reads on the instant emitter region, the second p from the left reads on the instant barrier layer, and the combination of the second n from the left and the third p from the left reads on the instant semiconductor gap region (see Figure 1A; and Table 1). Alternatively, with respect to said gap region, the combination of the second n from the left, the third p from the left and the third n from the left reads on the instant semiconductor gap region. With respect to claim 7, and in said alternative, the third p from the left reads on the instant first layer of semiconductor material, and the third n from the left reads on instant different highly n-doped semiconductor material. Said third n from the left is different from the third p because it is n-doped rather than p-doped; and the n doping is high in view of the 0.4 At% n-doping doping in JP '469's Table 1. It is the Examiner's position that said barrier layer inherently provides a potential barrier and Fermi-level discontinuity between the emitter region and gap region. When the first p from the left reads on the instant emitter region, the first n from the left reads on the instant barrier layer, and the combination of the second p from the left and the second n from the left reads on the instant semiconductor gap region (see Figure 1A; and Table 1). The last p (at the right) reads on the instant collector region, and JP '469 teaches the use of ohmic contacts (i.e., electrodes) as here claimed, and an external load (see paragraph 0053).

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It is the Examiner's position that said gap region inherently is at least 1, e.g., at least 5, carrier scattering lengths wide when JP '469's device is prepared using the materials in its example at paragraphs 0051-0054. JP '469 teaches the limitations of the instant claims other than the difference which is discussed below.

JP '469 does not specifically require using its device for refrigeration conversion. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used JP '469's device for refrigeration because such is clearly within the scope of JP '469's disclosure.

Response to Arguments

8. Applicant's arguments filed August 29, 2005 have been fully considered but they are not persuasive.

Applicant argues that independent claims 22, 31-33, 35, and 36 have been amended so as to recite some form of a segmented gap region, and Applicant exemplifies claim 22 which now recites: "wherein the gap region is segmented and comprises a first layer of a semiconductor material and a second layer of a metal or a different semiconductor material." Applicant argues that said claims 22, 31-33, 35, and 36 are now allowable over JP '469 for at least the reason that claims 11 and 17 have previously been allowed. Applicant argues that "a detailed reading of JP '469 shows that a segmented gap region is not disclosed or suggested." However, these arguments are not deemed to be persuasive because, as noted above, claims 11 and 17 are not deemed to be allowable. In particular, as set forth above, it is the Examiner's position that, in JP '469's Figure 1, the combination of the second n from the left and the

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third p from the left reads on the instant semiconductor gap region (see Figure 1A; and Table 1). Alternatively, with respect to said gap region, the combination of the second n from the left, the third p from the left and the third n from the left reads on the instant semiconductor gap region. With respect to claim 17, and in said alternative, the third p from the left reads on the instant first layer of semiconductor material, and the third n from the left reads on instant different highly n-doped semiconductor material. Said third n from the left is different from the third p because it is n-doped rather than p-doped, and the n doping is high in view of the 0.4 At% n-type doping in JP '469's Table 1.

Applicant argues that claims 7 and 28 are not obvious over the prior art for at least the reasons set forth above with respect to claim 17 and 22. However, this argument is not deemed to be persuasive because as noted in the preceding paragraph, it is the Examiner's position that said claims 17 and 22 are not patentable.

Allowable Subject Matter

9. Claims 34 and 37 are allowed.

10. The following is a statement of reasons for the indication of allowable subject matter: The solid state energy converters set forth in these claims, which includes $n^+/p/n/p_i/p_c$ and $p^+/n/p/n_i/n_c$ design structures, are not taught or suggested by the prior art.

Conclusion

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11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patents 3,391,030, 4,482,910, and 6,906,449 are hereby made of record

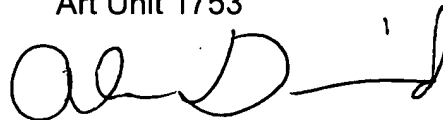
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
September 8, 2005

Alan Diamond
Primary Examiner
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A handwritten signature in black ink, appearing to be 'Alan Diamond', written over the printed name and title.